

PATENT COOPERATION TREATY

PCT

INTERNATIONAL PRELIMINARY REPORT ON PATENTABILITY

(Chapter II of the Patent Cooperation Treaty)

(PCT Article 36 and Rule 70)

REC'D 20 JUL 2005

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Applicant's or agent's file reference	FOR FURTHER ACTION		See Form PCT/IPEA/416																
International application No. PCT/US04/29715	International filing date (day/month/year) 09 September 2004 (09.09.2004)	Priority date (day/month/year) 10 September 2003 (10.09.2003)																	
International Patent Classification (IPC) or national classification and IPC IPC(7): H04L 12/28; H04L 12/66; H04J 3/24 and US Cl.: 370/229																			
Applicant HYPERDATA TECHNOLOGIES, INC.																			
<p>1. This report is the international preliminary examination report, established by this International Preliminary Examining Authority under Article 35 and transmitted to the applicant according to Article 36.</p> <p>2. This REPORT consists of a total of <u>4</u> sheets, including this cover sheet.</p> <p>3. This report is also accompanied by ANNEXES, comprising:</p> <p style="margin-left: 20px;">a. <input checked="" type="checkbox"/> (sent to the applicant and to the International Bureau) a total of <u>5</u> sheets, as follows:</p> <p style="margin-left: 40px;"><input checked="" type="checkbox"/> sheets of the description, claims and/or drawings which have been amended and are the basis of this report and/or sheets containing rectifications authorized by this Authority (see Rule 70.16 and Section 607 of the Administrative Instructions).</p> <p style="margin-left: 40px;"><input type="checkbox"/> sheets which supersede earlier sheets, but which this Authority considers contain an amendment that goes beyond the disclosure in the international application as filed, as indicated in item 4 of Box No. I and the Supplemental Box.</p> <p style="margin-left: 20px;">b. <input type="checkbox"/> (sent to the International Bureau only) a total of (indicate type and number of electronic carrier(s)) _____, containing a sequence listing and/or tables related thereto, in computer readable form only, as indicated in the Supplemental Box Relating to Sequence Listing (see Section 802 of the Administrative Instructions).</p> <p>4. This report contains indications relating to the following items:</p> <table style="width: 100%; margin-left: 20px;"> <tr> <td><input checked="" type="checkbox"/> Box No. I</td> <td>Basis of the report</td> </tr> <tr> <td><input type="checkbox"/> Box No. II</td> <td>Priority</td> </tr> <tr> <td><input type="checkbox"/> Box No. III</td> <td>Non-establishment of opinion with regard to novelty, inventive step and industrial applicability</td> </tr> <tr> <td><input type="checkbox"/> Box No. IV</td> <td>Lack of unity of invention</td> </tr> <tr> <td><input checked="" type="checkbox"/> Box No. V</td> <td>Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement</td> </tr> <tr> <td><input checked="" type="checkbox"/> Box No. VI</td> <td>Certain documents cited</td> </tr> <tr> <td><input type="checkbox"/> Box No. VII</td> <td>Certain defects in the international application</td> </tr> <tr> <td><input type="checkbox"/> Box No. VIII</td> <td>Certain observations on the international application</td> </tr> </table>				<input checked="" type="checkbox"/> Box No. I	Basis of the report	<input type="checkbox"/> Box No. II	Priority	<input type="checkbox"/> Box No. III	Non-establishment of opinion with regard to novelty, inventive step and industrial applicability	<input type="checkbox"/> Box No. IV	Lack of unity of invention	<input checked="" type="checkbox"/> Box No. V	Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement	<input checked="" type="checkbox"/> Box No. VI	Certain documents cited	<input type="checkbox"/> Box No. VII	Certain defects in the international application	<input type="checkbox"/> Box No. VIII	Certain observations on the international application
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Date of submission of the demand 26 April 2005 (26.04.2005)		Date of completion of this report 20 June 2005 (20.06.2005)																	
Name and mailing address of the IPEA/ US Mail Stop PCT, Attn: IPEA/US Commissioner for Patents P.O. Box 1450 Alexandria, Virginia 22313-1450 Facsimile No. (703) 305-3230		Authorized officer <i>Ahmed Elallam</i> Ahmed Elallam Telephone No. (703) 305-4700																	

Form PCT/IPEA/409 (cover sheet)(January 2004)

INTERNATIONAL PRELIMINARY REPORT ON PATENTABILITY

International application No.

PCT/US04/29715

Box No. I Basis of the report

1. With regard to the language, this report is based on the international application in the language in which it was filed, unless otherwise indicated under this item.

☐ This report is based on translations from the original language into the following language _____, which is the language of a translation furnished for the purposes of:

- ☐ international search (under Rules 12.3 and 23.1(b))
☐ publication of the international application (under Rule 12.4)
☐ international preliminary examination (under Rules 55.2 and/or 55.3)

2. With regard to the elements of the international application, this report is based on *(replacement sheets which have been furnished to the receiving Office in response to an invitation under Article 14 are referred to in this report as "originally filed" and are not annexed to this report)*:

☐ the international application as originally filed/furnished

☒ the description:

pages 1-89 as originally filed/furnished

pages* NONE received by this Authority on _____

pages* NONE received by this Authority on _____

☒ the claims:

pages NONE as originally filed/furnished

pages* NONE as amended (together with any statement) under Article 19

pages* 90-94 received by this Authority on 26 April 2005 (26.04.2005)

pages* NONE received by this Authority on _____

☒ the drawings:

pages 1-50 as originally filed/furnished

pages* NONE received by this Authority on _____

pages* NONE received by this Authority on _____

☐ a sequence listing and/or any related table(s) - see Supplemental Box Relating to Sequence Listing.

3. ☒ The amendments have resulted in the cancellation of:

☒ the description, pages none

☒ the claims, Nos. none

☒ the drawings, sheets/figs none

☒ the sequence listing (*specify*): none

☐ any table(s) related to the sequence listing (*specify*): _____

4. ☐ This report has been established as if (some of) the amendments annexed to this report and listed below had not been made, since they have been considered to go beyond the disclosure as filed, as indicated in the Supplemental Box (Rule 70.2(c)).

☐ the description, pages _____

☐ the claims, Nos. _____

☐ the drawings, sheets/figs _____

☐ the sequence listing (*specify*): _____

☐ any table(s) related to the sequence listing (*specify*): _____

* If item 4 applies, some or all of those sheets may be marked "superseded."

INTERNATIONAL PRELIMINARY REPORT ON PATENTABILITY

International application No.
PCT/US04/29715

Box No. V Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement

1. Statement

Novelty (N)	Claims <u>1-47</u>	YES
	Claims <u>NONE</u>	NO
Inventive Step (IS)	Claims <u>1-47</u>	YES
	Claims <u>NONE</u>	NO
Industrial Applicability (IA)	Claims <u>1-47</u>	YES
	Claims <u>NONE</u>	NO

2. Citations and Explanations (Rule 70.7)

Claims 1-47 meet the criteria set out in PCT Article 33(2)-(3), because the prior art does not teach or fairly suggest the followings:

A method for transport protocol optimization of an Internet protocol, comprising (inter alias):

Intercepting packets from a source application, at a transmission side, and using a process to act on the intercepted packet as the new destination for the intercepted packets, and aggregating the intercepted packet for transport over a communication link, wherein a reverse process is carried out at a destination side to deliver the packets to its destination application, as specified in independent claims 1, 42, 43, and 47.

Claims 1-47 meet the criteria set out in PCT Article 33(4), and thus have industrial applicability because the subject matter claimed can be made or used in industry, such as the transport of voice and /or data over TCP/IP networks

INTERNATIONAL PRELIMINARY REPORT ON PATENTABILITY

International application No.

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Box No. VI Certain documents cited

1. Certain published documents (Rule 70.10)

Application No <u>Patent No.</u>	Publication Date <u>(day/month/year)</u>	Filing Date <u>(day/month/year)</u>	Priority date (valid claim) <u>(day/month/year)</u> None
US 2005/0025150 A1	03 February 2005 (03.02.2005)	01 August 2003 (01.08.2003)	

2. Non-written disclosures (Rule 70.9)

Kind of non-written disclosure

Date of non-written disclosure
(day/month/year)

Date of written disclosure
referring to non-written disclosure
(day/month/year)

What is claimed:

1. A method of transport protocol optimization of an internet protocol, comprising the steps of (a) using a source packet interceptor to intercept IP packets from a source application, (b) using a source edge process to act as the new destination for the source application, (c) using a source packet driver to aggregate intercepted IP packets from the source application, (d) using a source data mover to transport the aggregated IP packets over a communication link to a destination data mover, (e) using a destination packet driver to disaggregate the transported aggregated packets, (f) using a destination edge process to deliver the disaggregated IP packets to a destination application.
2. The transport protocol optimization method of claim 1, comprising the step of using IP routing.
3. The transport protocol optimization method of claim 1, wherein the IP packet is optionally a TCP, UDP, ICMP, or other type of IP packet.
4. The transport protocol optimization method of claim 1, wherein intercepting an IP packet from the source application comprises the steps of comparing the IP packet's address to packet addresses in a look-up table and (b) intercepting only those source packets with the same addresses as those stored in the look-up table.
5. The transport protocol optimization method of claim 1, wherein the address of the IP packet comprises the packet's source IP address, source port number, destination IP address, destination port number, and protocol type.
6. The transport protocol optimization method of claim 1, wherein intercepting an IP packet from the source application comprises the step of routing the IP packet to an edge process that is exclusive to the address of the IP packet.
7. The transport protocol optimization method of claim 1, wherein intercepting an IP packet from the source application comprises the steps of a source edge process (a) reading the data contained in the routed IP packets and (b) forming a message header field for the routed IP packets.
8. The transport protocol optimization method of claim 1, comprising the step of the packet driver forming a packet driver message.
9. The transport protocol optimization method of claim 8, wherein the packet driver message comprises the message header field and intercepted IP packet data from the source edge process.
10. The transport protocol optimization method of claim 9, comprising the step of forming a plurality of packet driver messages.

11. The transport protocol optimization method of claim 10, comprising the step of aggregating multiple packet driver messages into a packet driver buffer.

12. The transport protocol optimization method of claim 11, wherein the size of the aggregated packet driver messages is less than or equal to a predetermined maximum size of the buffer.

13. The transport protocol optimization method of claim 12, comprising the step of the packet driver forming a routing header in the packet driver buffer that precedes a first packet driver message.

14. The transport protocol optimization method of claim 13, wherein the routing header comprises a function type field, a number of packet driver messages field, and a data length field.

15. The transport protocol optimization method of claim 7, wherein the message header comprises a version field, a length of header field, a message function type field, a message flag field, a protocol type field, a sequence number field, a source IP address field, a destination IP address field, a source IP port number field, a destination IP port number field, a length of data field, and a status field.

16. The transport protocol optimization method of claim 6, comprising the step of combining a routing header field, a message header field, and the intercepted IP packet data from the edge process.

17. The transport protocol optimization method of claim 11, comprising the step of using a compression engine to compress the aggregated packet driver messages.

18. The transport protocol optimization method of claim 17, comprising the step of routing the aggregated packet driver messages to the source data mover.

19. The transport protocol optimization method of claim 18, wherein transmission of packet driver buffers over a communication link by the data mover comprises the step of (a) inserting a data mover field into the start of the packet driver buffer; (b) if necessary, reducing the size of the packet driver buffer by breaking the buffer into multiple segments, with each segment being no greater than the size specified in the configuration file; (c) using standard UDP socket calls to interface with the TCP stack for UDP delivery of the segments over the network.

20. The transport protocol optimization method of claim 19, wherein the communication link is comprised of a TCP, UDP, or other TCP/IP link.

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21. The transport protocol optimization method of claim 19, wherein the data mover field comprises (a) data mover transport data subfield, and (b) data mover transport acknowledgement subfield.

22. The transport protocol optimization method of claim 21, wherein the data mover transport data subfield comprises the length of the entire subfield, the subfield type code, the logical sequence number of this transport message, and the physical sequence number of this transport message.

23. The transport protocol optimization method of claim 21, wherein the data mover transport acknowledgement subfield comprises the length of the entire subfield, the subfield type code, the highest physical block number sent from this side of the connection, the highest physical block number received on this side of the connection, the bit-significant flags representing the blocks received, and the rate of data delivery to the destination packet driver.

24. The transport protocol optimization method of claim 1 wherein packets are intercepted by an operating system exit point.

25. The transport protocol optimization method of claim 4 comprising the step of modifying the destination address of the IP packets accepted for interception to be the address of the source packet interceptor.

26. The transport protocol optimization method of claim 6, comprising the step of creating an edge process for each TCP application connection; a UDP edge process for each UDP intercept; and an ICMP edge process for an ICMP intercept.

27. The transport protocol optimization method of claim 1, comprising the step of terminating any connection between a source application and a destination application.

28. The transport protocol optimization method of claim 1, comprising the step of opening a connection between a source application and a destination application.

29. The transport protocol optimization method of claim 28, comprising the steps of (a) opening a connection between the source application and the source edge processor and (b) opening a connection between the destination edge processor and the destination application.

30. The transport protocol optimization method of claim 20, wherein the TCP, UDP, or other TCP/IP link for transporting the stored packets is over a WAN.

31. The transport protocol optimization method of claim 29, comprising the steps of (a) transporting packets from the source application to the source packet interceptor

over a source LAN and (b) transporting packets delivered to a destination data mover to a destination application over a destination LAN.

32. The transport protocol optimization method of claim 17, wherein a decompression engine performs the step of decompressing the aggregated packet driver messages.

33. The transport protocol optimization method of claim 1, wherein optimization is comprised of the step of using transport protocol optimization source software and destination software.

34. The transport protocol optimization method of claim 33, wherein, the source software optionally runs on a source server, a source network switch, or as a source network appliance and the destination software optionally runs on a destination server, a destination network switch, or as a destination network appliance.

35. The transport protocol optimization method of claim 34, comprising the step of optionally connecting the source and destination network appliances to a (a) network switch, which switch is connected to an application server running a application; (b) network switch, which switch is connected to an application server running a application and to a network router; or (c) to an application server running a application.

36. The transport protocol optimization method of claim 1, comprising the step of integrating the source packet interceptor, packet driver, edge process, and data mover into a source TPO.

37. The transport protocol optimization method of claim 1, comprising the step of integrating the packet interceptor, packet driver, edge process, and data mover into a destination TPO.

38. The transport protocol optimization method of claim 1, comprising the step of using a source TPO and a destination TPO to create a pair of TPOs.

39. The transport protocol optimization method of claim 38, comprising a plurality of pairs of TPOs optionally for multicasting and for multipoint communication.

40. The transport protocol optimization method of claim 1, comprising the steps of (a) attaching a source server running the source application on a source LAN, (b) attaching a source TPO on the source LAN and, (c) attaching a destination server running a destination application on a destination LAN, and (d) attaching a destination TPO on the destination LAN.

41. The transport protocol optimization method of claim 40, wherein the packets from the source application are transported over the source LAN to the source TPO and

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the packets from the destination TPO are transported over the destination LAN to the destination application.

42. A method of internet protocol optimization, comprising the steps of: (a) using a packet interceptor to intercept an IP packet identified in a look-up table as having a specified source address, source port number, destination address, destination port number, and protocol type; (b) using a packet driver to encapsulate the IP packet into a packet driver message, to aggregate packet driver messages, and to route aggregated packet driver messages to a data mover; (c) using the data mover to route via IP routing the aggregated packet driver messages to a second data mover over a UDP communication link; (d) using the second data mover to route the aggregated packet driver messages to a second packet driver; (e) using a second packet driver to disaggregate the packet driver messages and to dis-encapsulate the IP packet; and (f) using a second edge process to deliver the dis-encapsulated IP packet to a destination.

43. A method of internet protocol optimization, comprising the steps for: (a) intercepting an IP packet; (b) encapsulating the intercepted IP packet with an intermediate destination address; (c) aggregating encapsulated IP packets; (d) transporting the aggregated IP packets over a communication link to the intermediate destination address; (e) disaggregating the aggregated IP packets; (f) removing the intermediate destination addresses from the disaggregated IP packets; and (g) routing the packets to their respective destinations.

44. An internet protocol optimizer device, comprising a packet interceptor, edge processor, packet driver, and data mover.

45. The internet protocol optimizer device of claim 44, also comprising a second packet driver and second edge processor.

47. A device for internet protocol optimization, comprising means for: (a) interception of a packet; (b) encapsulating the intercepted packet with a message header field; (c) encapsulating the message header field with a packet driver message; (d) aggregating packet driver messages; (e) delivering aggregated packet driver messages to a data mover; (f) transporting aggregated packet driver messages to a destination; (g) disaggregating transported packets; (h) de-encapsulating the message header field; (j) de-encapsulating the intercepted packet; and (i) delivering the packets to their respective destinations.